SHOUT
SHARE
IT

SB 933
.R5
Copy 1

...udy in Humbugology

...t, 1920, by Fred Reinlein, 1751 Derby Street.
Portland, Oregon

... 159 July 1, 1920

SOON after the Hon. Gilbert N. Haugen became Chairman of the House Committee on Agriculture I made an attempt to convince him of the need of action on the part of the Department of Agriculture on a number of issues pending for years, practically all of which are discussed in my Circulars No. 155 to 157. Pending action Mr. Haugen sent me a copy of a hearing before the Committee last winter on behalf of appropriations for the Bureau of Entomology, which brought out a number of statements on the part of the U. S. Entomologist and his staff in reference to insects just now requiring special attention, and in regard to certain means of control for some of which I had especially requested Mr. Haugen to have the Bureau of Entomology define its position. In the absence of action, this copy of the hearing was examined by me, thoroughly annotated and returned to Mr. Haugen as a help to get action taken on just the points most wanted. However as soon as it was forwarded there arrived a letter from Mr. Haugen, this letter having been sent him by the Department of Agriculture, in which acting Secretary C. F. Mervin practically claims the means for the control of insects and fungi I recommend are worthless, this without giving the

SD91
.R5

slightest detail in any particular case. Therefore to enable the reader to judge for himself as to the merits of the case I take up a few of the issues, stating the position both of the Department and of myself.

The discussion before the Committee as to what the Bureau of Entomology considers to be the proper means for the controlling of the Japanese beetle in New Jersey offers a good example for a general understanding as to the merits of the claims on each side.

On page 35 of my Circular No. 155 I called attention to the fact that the U. S. Entomologist in his report for 1918 had stated among other things that this beetle is a very general feeder, having up till then been found on 41 plants, including such a variety as grape, apple, cherry, buckwheat, sweet potato, corn, many ornamentals and weeds, as smartweed, morning glory, black locust, ironweed, etc.

According to the Entomologists' statements the insect lives 10 months out of 12 in the ground as a grub and the "larvae feed on decaying vegetable matter." I pointed thereupon out that this means that, as a rule, "they are hidden on the top of the soil right below that layer of decaying vegetable matter where they and also the resulting pupae can be readily found by poultry." Evidently the beetle oviposits by preference in grasslands as do many other beetles of similar habits, May beetles for instance. If then the use of poultry, carried on systematically and on a large scale, was no good, why does not Chief Howard explain? As he did not do so, I call attention to the ways he expects to employ to destroy the larvae,

©CLA570997

AUG 10 1920

for Mr. Mervin makes the following claims: "....All of the methods that Mr. Reinlein recommends so strongly have been investigated from time to time by the experts of the Department and none of them has been found to be of any great service except in a most restricted way....." Thus, if the Entomologist has tested out the use of poultry for the destruction of those grubs as claimed, and this systematic use of poultry was described by me as far back as 1915 in my Circular No. 146, let him explain why it did not work with the grubs in the soil 10 months out of 12. What method does the Entomologist use in its place, and which he claims to be better? He uses "cyanide of soda in solution at the rate of 1 pound to 200 gallons of water and applied at the rate of 22000 gallons per acre." That is very expensive. This then kills "most of the larvae." If it does, it means it kills those that are near the surface, where poultry could have easily found them and grown fat at the job. Then again how about the beneficial insects the Entomologist says he wants to set to work. Probably the most valuable ones are the ground beetles, which would probably be as much affected by the poison as the grubs. Then there is probably some danger of poisoning stock, involving at any rate, careful watching. "Weeds along the roadsides have been burned to destroy their food and render such places unattractive to the beetles, thus.... waste-places along ditches and other spots which cannot well be treated with cyanide are being cleared of weeds. . . ." Ditches and roadsides want to be kept in tough sod and burning and "clearing" is destructive to both, because of the resulting ero-

sion. Such a course adopted generally would fill up the rivers and reservoirs with sediment. Chief Howard knows the destructive effect of erosion since I had called his attention in past Circulars to official literature in regard to this matter and often quoted from it, for instance on pages 32 to 35 of my Circular No. 157.

"Plowing the soil infested by the grubs and pupae appears to destroy them. It will be necessary to do this kind of work very extensively in waste places and many areas not under cultivation." Aside from thus increasing erosion, where will there be left any hibernating places for any beneficial insects? Again, this means destruction of cheap pasture and means treating meadows and pastures with cyanide, rendering farming intolerably expensive. Also Chief Howard has a habit of talking about protecting wild birds in one breath, and about burning over "wasteplaces," their natural home, in the next.

"The work of eradication and control has been vigorously prosecuted....but in spite of all that has been done the insect is increasing rapidly over new territory and at the time of the present writing is perhaps 150 per cent more abundant than at the same time last year." Why then talk about eradication at all? When I call attention to such things the Entomologist tells his Superior I am trying to assail the Department.

"During hot days the Japanese beetles are strong fliers." The territory given in the 1918 report is 25,000 acres. Now after the pest has had a rapid increase, it is said to cover only 15,000 acres. "While the beetles are flying a wide barrier of

poisoned foliage is maintained as completely as possible around the whole area of infestation." With an appropriation of 130,000 dollars a year for 25,000 or 15,000 acres you can do a lot of things to buncoe the people with a supposed possibility of eradication, things that are absolutely out of question with the man that has to make the farm pay.

On page 36 of my Circular No. 155 I described 2 ways of handling the beetles. First, while the beetles are dayflying, they probably also fly during the early part of warm dark nights, and in that case can be more or less successfully trapped with a torch, used as a light trap, to be later described in conjunction with the European cornborer. Another method was also described. It "consists in concentrating the adults to tassels of late-sown corn, especially sweet corn. As "the insect attacks the ends of sweet corn," there is in the first place no good reason why with the preferred food supply short as the insect becomes more generally distributed, it should not attack field corn heavily. But with the beetles strong fliers during hot days from midsummer till fall, it will, with corn a favorite food plant, be possible to attract the adults to the tassels of late-sown corn when such tassels are in the pollination stage. A little such corn sown two weeks apart so as to provide tassels from midsummer till fall will decidedly concentrate the beetles. If this corn be then rolled down, poultry given access could do the picking off, otherwise it has to be done by manual labor."

I then went on to show that this is merely an adaptation of a method I described as far back as 1898 to concentrate the

adult harlequin cabbage bugs, and that later on I showed that this bug can best be controlled by providing some cruciferous plant going to seed at intervals during the season, and have the bugs picked off by poultry. The Entomologist lies when he says this method is no good and that the Bureau has a method that is better, for Mr. Mervin has been induced to say "the methods of the Department are without exception based upon careful field investigations by competent experts."

The harlequin cabbage bug has recently received renewed attention on the part of the Bureau of Entomology in Farmers' Bulletin No. 1061. What makes this insect of increasing importance is the fact that it has learned to breed on a large list of cultivated and wild plants other than crucifers, making the old standby in control of it by the Bureau, "clean cultural methods," even more impracticable of effective application than it was before.

Some of these non-crucifierous cultivated plants are: " . . . truck crops of nearly all kinds . . . of which eggplant, asparagus, potato, tomato, okra, beans and beets are most affected" (p. 8). Also: " . . . squash, late corn, grapes, and nursery plants of citrus, loquat, cherry and plum. The bugs are also partial to weeds other than crucifers, including ragweed, pigweed, wild lettuce and lambsquarters. They congregate on all parts of these weeds, but appear to prefer the stems." "The stems" evidently mean the forming seedstalks, these containing the choicest juices of the plant.

Says the Bureau on page 11: "The grower should bear in mind the unusual fondness of this insect for horseradish,

which, being a perennial crop, serves as a natural trap crop throughout the growing season. The foliage of the horseradish should never be neglected so that the insects are permitted to breed on it continuously. . . ." The use of handpicking and of a torch are recommended. But the bugs on horseradish are largely hidden and such destruction is in reality not what could be desired.

As horseradish, grown for roots, does not bloom, and has no seedstalks where the adults might be exposed to view, why not then see to it to have all through the season some cruciferous crop nearby going to seed, as then the adults will largely congregate in plain view on the stalks, can be picked off, possibly by the use of poultry, and thus the pest in the whole neighborhood be kept down to harmless numbers. This use of cruciferous seedstalks is especially effective when used out of season, that is, when few or none of the cruciferous plants, wild or cultivated, are normally in bloom. Thus a row of stumps of early cabbage, or, still better, of early cauliflower, could be allowed to throw up seedshoots in and after midsummer, purely to act as traps, when few crucifers will be in bloom.

"The large size and bright colors of the insect and its scorn for concealment render it easy to detect . . ." (p. 11), yes, the adults. How about the nymphs? "The eggs . . . are normally placed on the underside of the leaves . . ." (p. 7) and the nymphs, as normally, feed out of sight. Of course the aim should be to concentrate the emerging hibernated adults in the spring. "Throughout the year wild plants of the mus-

tard family should be carefully kept down, not only in the fields, but in the immediate neighborhood . . ." says the Bureau on page 10. A big job, and just what "immediate neighborhood" is to mean the Bureau is wise enough not to say. There is pretty good evidence to show that the adults, on warm spring days for instance, can fly for miles when in need of choice food. A systematic use throughout the season of a specially attractive crucifer in bloom, such as rutabagas, cabbage or cauliflower, through sowing or planting a traprow along some crop likely to attract the pest in large numbers, will concentrate the bugs, and there is no good reason why this picking off could not be done then by poultry, if a little grain is scattered along these trapplants.

"The value of the hand torch for the control of this insect has been proved by experimenters in Texas. . . . Its chief value is in the destruction of the insect on trap crops, although an experienced operator can safely apply it to a garden or commercial field, bearing in mind that only an instant's contact with the hot flame, i. e., sufficient to cause the bugs to drop to the ground, will so injure them, by scorching the legs and attennae or "feelers," as to render them harmless and incapable of recovery. The brief contact necessary to accomplish this will not injur the plant. . . ." (p. 12). This is essentially what I had shown to be the case as far back as 1898 and the Bureau all along was wanted to show who it was, if anybody, that described this method before that date.

However this admission, as it stands, means a lot more than what it shows on the surface. If a moment's scorching

of such a stout bug renders it incapable of recovery, why could not then a torch of some such type as shown on last page lick off for instance the lice or thrips on grains, or why could not a torch outfit be designed to lick off lice or pear thrips on tall trees?

The Bureau on page 12 calls attention to the fact that "in cool or breezy weather" a torch is likely to give trouble and advises the use of a vaporizing coil inclosed in the burner to remedy this trouble. There stands nothing in the way to devise a suitable torch for the use on vegetation of any height and under anything like favorable conditions, as repeatedly referred to in Circulars No. 155 to 158. Naturally strong wind is to be avoided. But it is less of a detriment than in spraying and dusting.

Again I had shown as far back as 1898 that the harlequin bug is attracted to the pollen of sweetcorn. Hence, with the insect greatly extending its range of food plants, certain non-cruciferous plants, grown for use or ornament, when in bloom, will act as special attractants for the adults, as also in the range of the Japanese beetle they will serve to attract and concentrate the beetles.

For concentrating the Japanese beetle rows of millet might be even better when in bloom than sweet corn, making easy picking for poultry.

Thus since neither Chief Howard nor anyone else can prevent further spread of the Japanese beetle, the practical control of this insect resolves itself into the judicious and extensive use of poultry the year around. Instead of contin-

ually advocating the burning over or plowing up of lands not under cultivation, poultry working under supervision of man can and must be made to do as near as possible all the work previously done by wild birds, now with most of the country under cultivation reduced to a fraction of their former number.

Thus for instance on pages 24 to 38 of my Circular No. 157 I was discussing the control of the grainbug and the Mexican conchuela, doing great harm in the dry sections of the Southwest and West. I pointed out from the Department's own literature that plowing and burning and the use of chemicals as advocated by the Bureau of Entomology in Department Bulletin No. 779 destroys the slow growing, drought resisting native grasses and turns the land over to the worst kinds of weeds. I showed that encouraging the development of poultry solves the problem with and without concentrating the bugs to millet or other crops in best condition at certain times. If this use of poultry as described was tested out as claimed, why are not any definite statements made?

A striking case of where poultry proves to be the only feasible means of control in the case of an insect often occuring in enormous numbers was given on pages 13 to 16 of my Circular No. 157. The insect in question is the smoky cranefly. This insect is capable of doing great damage in destroying cereal and forage plants, as many as 200 larvae having been found in an area a little over a square foot. There are many species of this genus present as adults at different dates be-

tween spring and fall. Poultry, it was shown, would get many adults as they oviposit in grass, preferably such as is rank. Then also, the larvae were shown to make small ridges through burrowing just below the surface of the soil, attracting admittedly the attention of birds, hence also of poultry. The Bureau does not recommend the use of poultry. They recommend nothing altogether. They have no remedy. Only in the case of a late ovipositing species they make an attempt at showing a means of control and what do you think it is? It is close grazing of pastures "as the adult flies usually congregate in rank growth of grass, clover, weeds, etc., and there lay their eggs." That is, here the Bureau wants to have waste places handy with rank growth on it, to protect the meadows, the very places they habitually say should be burned over or plowed up. Such places, of course, are the breeding ground for many insects, injurious, beneficial and neutral, but they are the very places for poultry and stock to gain a great deal of their sustenance and thus keep the cost of production down. One should think a man claiming to be an economic entomologist would not need to have such facts hammered into his head. But then there are none so blind as those that do not want to see. Taking this case as an example, it is obvious that with poultry having access, the insect could never become really plentiful.

Under primitive conditions all land was what the U. S. Entomologist calls "waste places." Wild birds and beneficial insects could thrive there and insect outbreaks were then practically unknown. Extensive cultivation furnishes an in-

crease in food plants, and a corresponding decrease in facilities for the multiplication of birds and beneficial insects. Hence, in modern agriculture, poultry must be used as far as possible to take the place of wild birds. Without this, of course, such "waste places" are always liable to furnish an overflow of injurious insects to attack cultivated crops. On the other hand, if a field is cleared, these "waste places," such as headlands and fencerows, concentrate the insects, and it is up to poultry to keep them down. In this way "waste places" are used to protect succeeding adjoining crops against a great variety of insect outbreaks.

On page 16 to 19 of my Circular No. 157 is given a short account of the value of poultry in the control of the New Mexico range caterpillar. Also from Department Bulletin No 124, p. 28, issued by the Bureau of Entomology, is shown that Mr. Chas. Springer of Cimarron, N. M., hires a boy to herd an immense flock of turkeys to keep the grasshoppers down. The Bureau was wanted to show for 5 years past why then the use of poultry for the control of the range caterpillar during 10 months out of 12, when the insect is not in the form of a caterpillar studded with urticating hairs, should be impractical, being as poultry are a domesticated form of natural enemy of insects in general.

About 7 years ago the Bureau of Entomology attempted to establish a calosoma beetle (C. sycophanta) in the range caterpillar belt. I pointed out in my Circular No. 146 and 147—the Entomologist calls it a theory—that the attempt would be useless, showed that the insect as larva has to work there

unprotected and exposed to view by birds, and being hairless, is attractive to them, while the hairy range caterpillars are repellent to them. I showed from U. S. D. A. Bulletin No. 251, p. 9, that skunks, raccoons and foxes destroy the beetles, as also do many other smaller animals. I showed the insect has trouble maintaining itself in the woodlands of Massachusetts, where as adult and larva it can climb the trees and be out of reach of many of the enemies that attack it on and in the ground. When I tell them such things, referring to their own writings, they, the Entomologist and the Pathologist, make their Superior say "his recommendations obviously are purely theoretical and made without experience with the insects and without other knowledge of the various subjects he treats than that afforded by the literature."

On pages 21 and 22 of my Circular No. 157 you find some of the main causes why the use of poultry is the best means to control the Argentine ant at large as pointed out as far back as my Circular No. 117. The Entomologist does not want to admit this, or in turn show why it should not be so. On page 14 of his report for 1919 he makes reference to a new ant poison used in connection with banding to protect citrus trees against multiplication of mealy bugs through the agency of the Argentine ant "which has resulted in one of the most notable successes in insect control in the State of California." In the case of citrus trees such a treatment is quite feasible as far as cost is concerned, but ask the Entomologist how he would prevent the Argentine ant from fostering the mealy bug on sugar cane and other crops and he has to admit he has

nothing that is tangible.

On page 31 of my Circular No. 151 I had shown from the Bureau's own writings (Ent. Bull., No. 122, p. 73), that an English sparrow was found industriously picking up the Argentine workers from a trail, as also a flicker digging up shallow ant nests for adults, pupae and larvae, yet according to the Entomologist's contention I was wrong when I claimed that poultry, being by nature an enemy of the pest, can and should be made the chief reliance to control the pest at large.

On page 38 of my Circular No. 155 a short reference is made to poultry as the best means to control the alfalfa weevil, a plan partly endorsed by the Bureau of Entomology in U. S. Bulletin, No. 107, p. 57. If poultry is of value when used sparingly as there admitted, why cannot their number be increased and they thus be used to protect farm crops at large. The Bureau advises the use of poison. While this can be made to give satisfaction as far as it goes, I had shown on pages 8 to 15 of my Circular No. 155 that alfalfa may be attacked at the same time by other pests where poison is of little or no use, while poultry is of use. I mentioned the garden web worm, discussed as an alfalfa pest in Farmers' Bulletin, No. 944. The insect is not at all readily amenable to treatment by poison, on field and forage crops, but I showed poultry can readily secure the pupae in the ground, also many adults as they hide about the plants during the day, and they can secure the larvae on the plants. Then there is the alfalfa caterpillar, the larva of a butterfly. This insect can easily be secured by poultry as adult, as larva on the plants, and as pupa hanging

on the plants. Rootborers might be present, as briefly mentioned on page 13, and carried out in detail on pages 1 to 4 of my Circular No. 145. Poultry is far the most feasible means to check this trouble by securing the bulk of the adults. If not, have the Entomologist show why this should not be so in this and all the cases previously mentioned, and many others specifically discussed in my Circulars No. 146 to 151.

However the habits of the majority of the injurious insects are such, poultry can be but little used in their control or not at all. Of the newer insects of this class the European cornborer makes a good illustration. In the case of this insect the use of poultry is thus summed up on page 11 of my Circular No. 156, which gives on pages 1 to 11 a complete description of my means of control: "During the resting season infested grasses and weeds will break at many of the points infested and poultry given the run will get a large part of the borers." Poultry can thus get the borers down to the roots, really the only feasible way they can be gotten at all there and without having removed the protecting shelter furnished by the tops to the roots of the plants, if perennial, during the winter; or, in the case of annuals, furnished for the protection and enriching of the soil and the sprouting of new growth of better plants than could succeed were such protective cover removed. In cool sections of the country where this insect is singlebrooded, this course goes a long way as a means of control. In such sections corn growing is not much of a factor, but the insect can there seriously injure many other plants, since with its wide range of foodplants it can increase enor-

mously within a few years. My plan to attack the insect during the breeding season, as briefly given on page 3 of my Circular No. 157 in the case where the insect is singlebrooded, consists in providing a patch of grasses, forming seedheads at the time the bulk of the hibernated moths are about to lay their eggs. If the surroundings are kept reasonably clear, by mowing or grazing, of suitable seedheads for the time being, this trappatch will receive the bulk of the eggs. The sooner this trappatch is cut after the bulk of the eggs has been laid, the greater will be the mortality of the larvae developing in this crop. In any case, if this crop is carefully utilized before the time of emergence of the moths the following spring, the bulk of the borers that would otherwise survive will have been killed, doing away, simply by the judicious growing and cutting of forage crops, with the necessity of winter attack as claimed by the Entomologist in his report for 1919, p. 1, as follows: "....The vulnerable point in the insect's life history is in its hibernation as a caterpillar in the stalks of corn and in the stems of other plants which it attacks and there is a large list of them...." It is exactly the large list of food plants what makes winter attack impracticable, all the more as destruction, one way or another, is to include "the stubble and upper part of the root," and the plants attacked include many perennial plants both wild and cultivated, all of which need the "stubble and upper part of the root" as a protection against thawing and freezing to even survive. In practice we know that these foodplants are scattered over lands owned by many different people, many of them not directly interested in con-

trol. A law to permit a neighbor to let poultry run over such uncared for lands during the dormant season can easily be passed, while enforcement of repression after the U. S. Entomologists' method is out of question. The insect is carried in spinach, celery, beans, beets and other truck crops, and certain part of New England dependent upon these supplies from the infested area in Massachusetts opposed quarantine rather than go without the supplies.

".... By the failure of the Federal appropriation the opportunity for very effective work was lost...." A claim the appropriations were short or not available can always be worked by supposedly honest experts on Members of Congress that listen only to their side of the story. If to offset this calamity, the House Committee on Agriculture will now only get a good hold on the Entomologist's wool, we will soon settle down to very effective work all around. "The result was that with the appearance of the moths issuing from untreated or imperfectly treated areas in Massachusetts there was a spread at the end of the fiscal year, so that at the date of the present writing, August, 1919, the insect is known to occur over an area of 1000 square miles...." By October 1st the spread is given as 1200 square miles in the report of the Federal Horticultural Board. The pest is now considered to have been "introduced about 9 years ago (1910) with large importations of Hungarian broomcorn," that is, was not discovered till 7 years after its introduction.

Where the insect has two broods, the first brood is to be taken care of by the use of forage crops furnishing an abund-

ance of suitable seedheads, and cut in time to cause the greatest possible mortality of the grubs as just described. If the trap crop is not cut, because of rain or for other reasons, till the borers are nearly ready to emerge as moths, this trap crop should be at once baled to reduce the emergence of moths to the minimum. However, if corn is to be protected against the second brood, this can be done by providing another trap-patch at the time the moths of the second brood appear. This might be corn sown rather thinly for fodder, with many stalks then throwing up tassels, or we might use a suitable mixture of grasses just then heading.

However the corn or other crop it is desired to protect may be as attractive as any that can be provided. This is especially likely to happen where there are 3 to 5 broods. Some of the broomcorn in which the pest was imported went to New Orleans where the insect could produce 4 broods, with 5 in South Texas. To obviate this difficulty I described on pages 5 to 10 of my Circular No. 156 a system of trapping the moths with some such apparatus as shown on last page, fitted with certain attachments. In practice the torch illustrated is suspended on the hook shown in the illustration as serving as a handle for the piston rod, about 12 feet from the ground, hose, pipe and burner to hang down perpendicularly. A pail is hooked on the burner. This pail receives a spittoon-coverlike fitting, flush or slightly below with its top, and over the burner is placed a similar lampshade like fitting. This leaves a circle of light to shine forth from between these two corresponding cone-shaped fittings, one and one-half inches

apart being about best for general work.

The pail contains some sweet smelling liquid. In the case of the corn borer a mixture of molasses and water would probably be the most suitable all around. This mixture, being kept steaming through the blast blowing down upon it, attracts insects fond of such sweets, even if these insects were otherwise repelled by the light. The torch doesnt't make a bright light. This in cases where insects are rather adverse to light is an advantage. Also where the place is rather small, since each individual farmer is primarily interested in freeing his own grounds, not those of his neighbor. According to a statement made by the Entomologist before the Committee the corn borer is attracted to light and has been known to be carried on trains because of thus being attracted. If thus a crop it is desired to protect is as attractive to the moths as is the trap patch, such a torch placed into the trap patch would detract, both by the light and by the smell furnished, the moths from the crops it is desired to protect. Even if the trap did not catch a single moth, it would protect the crop indirectly by inducing the moths to oviposit on the trap patch.

Thus in the cotton belt the corn borer would no doubt breed in cotton squares. And what is more, it would be difficult, if not impossible, much of the time to provide a more attractive crop for trapping, as the squares when tender and plentiful are likely to be preferred to all else. What is the use to protect the squares with poison against the bollweevil, feasible only late in the season, when the corn borer can destroy every square in spite of such protection, being not ma-

terially affected by even frequent use of poison?

The same holds good with the pink bollworm, now getting well established at the northern border of Mexico and present now in certain parts of Texas. The limitations in the use of poison in the control of the bollweevil are discussed on pages 1 to 4 of my Circular No. 154. The reasons why with the pink bollworm present in Mexico it cannot be kept out of the United States are given with means of control on pages 12 to 18 of the same Circular. It is there shown that in the first place the pink bollworm causes a severe shedding of squares early in the season. Imagine with the bollweevil, the European cornborer and the pink bollworm all causing severe shedding, with the corn borer capable over most of the cotton belt of producing 4 broods at an average of 450 eggs per female and the pink bollworm a good second, both increasing with virulence towards the end of the season in the absence of any efficient official means of control, being limited in increase purely by lack of suitable oviposition material as far as cotton is concerned. Of official means the Bureau has for the control of the bollweevil only poison, which is effective only late in the season, and not likely to be of much value where the season is short, or if bugs, lice or red spiders are present also, to take what the bollweevil does not take. For the corn borers there is nothing officially endorsed but "cleaning up" in winter, and for the pink bollworm nothing but a similar "clean-up."

Speaking of means of controlling the pink bollworm you read on page 7 of the Report of the Federal Horticultural Board for 1919 that "under the labor scale in the United States

the intensive clean-up methods required" (to control the insect in Mexico and Egypt under the present official methods) "would be almost prohibitive in cost." At that the "methods" are only "fall cleaning and destruction of old plants and the replanting with clean seed." That is the Bureau has no means to attack the insect during the growing season. I quoted on page 16 of my Circular No. 154 from official literature as follows: "The pink bollworm affects the production of cotton in several ways. First a considerable number of squares and bolls are so injured that they fall to the ground. In case of heavy infestation fifty per cent of the crop may be destroyed in this way...." And I there showed that poultry would secure a certain number of the moths hiding on the plants during the day and "poultry forced to patrol the cottonfield by being fed and watered and held there long and often enough to keep the pest under control will attack these squares and bolls same as they are wanted to attack squares and bolls infested by the bollweevil....it is obvious that the most efficient work with poultry is early in the season. . . ." I also there showed that where there are two or more broods of the pink bollworm a year as occur on American cotton in India and would occur in most of our cotton belt, the pupal stage is spent in a cocoon in the ground an inch below the surface, being thus also subject to attack by poultry. All this, according to the U. S. Humbugologist is purely theoretical. Having stuck his snoot out of the rathole and spit out his venom, he crawls back, hoping he won't be followed by a hot poker.

As given briefly on pages 19 and 20 of my Circular No.

157 I had shown that the destruction of cotton stalks early in the fall drives the bollweevil to adapt itself to go either without cotton during this period, or learn to breed on plants other than cotton. I showed that if a small patch, preferably reserved at planting time, and located in the center of the field, about the hundreth part of the field in size, be sown to cotton very late, this patch would attract the bulk of the weevils, where poultry could make constant war on the grubs in fallen squares, and also on the adults up till frost, and even up to the destruction of the plants, that thus there will be but comparatively few weevils to enter hibernation even with all the plants left standing and bearing till frost. I showed that poultry could patrol all the fields in the winter and spring, showed that with the falling of squares poultry could be made to patrol the cotton field. Thus if the corn borer or the pink bollworm, or both, be present, poultry could keep these down at the same time. In addition I showed both the corn borer moth and the pink boll worm moth could be attacked by the use of a torch light trap, as previously described.

For a number of years the Bureau of Entomology had practically nothing to say about the size of loss caused by the bollweevil. On the contrary they made a systematic effort to have the farmers look at the bollweevil as a blessing in disguise through forcing diversification of crops. Now that a partially successful method of using poison has been evolved, Secretary Meredith says the department has found a way to get the weevil, and gives the loss in years gone by as $200,000,000 a year. But after you have read Farmers' Bulletin

No. 1098: Dusting Machinery for Cotton Boll Weevil Control, you will come to the conclusion that there are yet, as practically there admitted, a good many obstacles in the way of success, and that the use of a trappatch late in the season, as advocated by me, by concentrating the weevils, also makes much easier the control of the weevil by poisoning, if this method is chosen in preference to the use of poultry, by keeping poisoned only this trappatch.

Secretary Meredith says the pink bollworm is present already in 12 counties in Texas and Louisiana, and says we have to eliminate it without delay. The worm was discovered in the fall of 1917 in 3 localities in Texas and the "eliminating" began right there and then. A spread to 12 counties meanwhile, in several localities, and in spite of the Department's best efforts, does not look much like elimination. Moreover I had shown on pages 12 to 18 of my Circular No. 154 that with the worm established in Mexico, the worm cannot be kept out because the adult lives for about 17 days, and in the absence of cotton can feed on pollen or nectar of other malvaceous plants, thus can travel long distances in search of cotton, its "much favored food plant." In addition: ". . . Hibiscus and other plants closely related to cotton may serve as hosts for the pink bollworm . . ." (Rep. Fed. Hort. Board, 1919, p. 7). Thus elimination would not be worth while, even if it could be secured at moderate cost, since reinfestation across the Rio Grande would follow at once. Mr. Meredith admits the worm "may cost another $200,000,000 a year." Hence the need of having the merits or demerits of my system of control

sifted to the bottom.

"Imagination spells the difference between small success and big success," says Secretary Meredith. Yet it is imagination, or theory, about me what the U. S. Entomologist is always harping about. All investigations are based upon imagination, or theory, and the investigation most needed just now is to have the Entomologist's wool examined, for, in effect, he claims to have examined mine.

As the U. S. Entomologist is trying to throw brickbats at me while he thinks the throwing is good, we might just as well look at some of the tests he intends to make to establish the life history of the European corn borer. In the hearing before the Committee the question was raised how far the corn borer moth can fly and the reply was given as 600 yards as the longest known distance at a single continuous flight, the moths being capable to make many shorter flights in a given evening.

At the same time Dr. Howard said the experts in charge propose to set aside a territory of 25,000 acres heavily infested and try to eradicate the pest from there. As the pest is to be attacked practically during the hibernating period only, with trap crops and trap lights such as described by me condemned, and as the pest goes as low as the "stubble and upper part of the root" of practically any hollowstemmed plant, wild and cultivated, and with the borers admittedly capable of being completely hidden in ears of corn, this in itself can safely be said to be an absolutely futile attempt. But granted those 25,000 acres can be cleared regardless of cost, and it would cost about as much as pumping the ocean dry, I had shown

on page 35 of my Circular No. 155, that 25,000 acres, the area there given as being infested by the Japanese beetle, is about equal to 39 square miles, and that a circle with a radius of three and one-half miles would include this area. Three and one-half miles is about 18,000 feet and as a flight of 600 yards is 1800 feet, we find that a moth is likely to fly all through the patch the first evening, which means that such a test cannot have the slightest value.

Also one member of the Committee showed a clipping from an agricultural magazine giving a report by one of those "show-me" fellows on how he found experts of the Bureau to work at establishing the life history of the borer. He said 4 experts had been detailed to clear a small piece of ground of the cornborer, and as he found they made very slow headway by using snippers, asked them why they did not use a scythe, as then one man could do the job in half a day. He said they told him they were to remove only hollow stemmed plants, and this was the cause of the slow work. Evidently they were under orders to carry out an experiment, probably on a small scale the very thing that Chief Howard now proposes to do with 25,000 acres.

Anyway, Dr. Howard showed no hankering for details, but began at once to whitewash his experts on general principles by saying, that plenty of people call laborers, employed by the Bureau, experts, that it is usually difficult to secure the best kind of help, and that the work is not at all done that way, thus putting the responsibility upon common labor's broad back. As the cost for half a day or a day was given as fully 50

dollars, it must be clear that it was not common labor that was employed.

In calling attention to the benefits to be derived in the control of the bollweevil from the use of poison on cotton late in the season, Chief Howard mentioned a profit of 9000 dollars on 150 acres made by one of the southern State Entomologists saying in effect: "This shows the possibilities of results in using a trained man." A member of the Commttee thought this was not a particularly good showing when Dr. Howard said: "Of course we can do much better than that." The facts are, anybody knowing enough to make a farm pay could do as well as that State Entomologist could, after Mr. B. R. Coad had described the method in Department Bulletin, No. 131, and to be able to do much better is virtually nothing but an idle claim. It so happens that the expert in question is the one mentioned in connection with his worthy colleague, the State Horticulturist, on page 7 of my Circular No. 154, the latter making Mrs. Hettie Dawson, their colored cook, say chickens won't eat bollweevil, and who both refused to make that statement over their signature. This same expert was doing the leading work under Dr. Hunter in getting out the life history of the bollweevil as given in Entomology Bulletins No. 45 and 51.

As the Bureau now recommends the use of poison late in the season, this means plants bearing squares available for breeding up till frost, and a consequent heavy survival of weevils in the spring, and brings again the question to the front as to what can be done to reduce their number in the

spring. The Bureau after testing the benefit to be derived from the picking up of fallen squares for 20 years had to admit that it is not feasible even with stalks destroyed early in the fall.

Contrary to the Bureau's claims I showed from their own tests that the bollweevils as they arrive at a field, that had been previously cleared of them, if present, by a plowing well ahead of planting time, settle at the edge, and from this I proved that the only possible chance then known to check the weevil in the spring through collection by hand labor consisted in examining the edge of the field daily for arriving weevils after squares have begun to form and keep this up till emergence is over, thus preventing females settling at the edge from becoming fit for oviposition by feeding for 4 days upon squares and fly into the field in search of more squares, 5 squares per day being required by a female then on the average.

I proved this from a test recorded in Entomology Bulletin No. 45, p. 87, also given on page 115 of Bulletin No. 51. The field in question was in an isolated location and planted new to cotton, and when infestation was discovered on August 6 it was "entirely restricted to a small area," the claim being made "it is evident that infestation began some time in July." As early as my Circular No. 32, February 18, 1905, I claimed from this that infestation is originally confined to the edge of the field, but, as the Bureau did not take any action on this point for 5 years, it was not till my Circular No. 117, 1910 that I pointed out that unless the weevils are promptly picked off before any females are fit to oviposit, they will work their way

into the field. I carried this out in minute detail for the first time in my Circular No. 127, 1912. I showed that Dr. Hunter, in charge, and his staff were wrong in claiming that infestation began in July, because they had to admit that infestation came from a cottonseed house just across the corner where infestation began, from which it was clear that infestation began during the usual time of emergence, say March 1 to June 1 in that locality, Victoria, Texas. Hence the weevils had practically 3 months in which to feed on squares and were by August 6 still confined to a small area, only explainable by assuming that the original infestation was extremely slight in this case. This in turn showed that usually the infestation is much heavier and that therefore if the weevils are to be secured by hand labor they must be secured daily at the edge during the period between the beginning of the setting of the squares and the end of emergence, usually about four weeks. To get a female there means to prevent the oviposition of an average of 139 eggs in that many squares, all scattered over the field. Not only this, but it means to let weevils fly in unchecked before any picking can begin, a period of about 10 days to the first fallen square. Moreover many squares shed without being infested. From all this it was possible to show in a mathematical way that the picking up of squares is of necessity utterly unprofitable. The Bureau now admits this.

When beginning to realize in 1915 the possibilities of using poultry in the control of the bollweevil and many other cotton insects, many of these feeding and developing a first brood on the early vegetation outside of the cottonfield, I first

of all called attention to the benefit that could be derived through watching the surroundings and the edges of the field with poultry in the spring, originally given on page 20 of my Circular No. 147. Subsequently I showed that poultry can be used the year around and made especially efficient by the use of a trappatch in late summer. This course renders the poisoning of cotton for the bollweevil quite superfluous and takes care of bugs, cutworms and many other insects not amenable to poison.

If poultry were not thus efficient as claimed, the trappatch could be kept heavily poisoned from July till cool weather sets in, doing away with the difficulty of poisoning the whole field.

The forced reliance on the late use of poison under the Bureau's present system of control exposes the crop to many other dangers. Aside from insects and fungi there is the added danger of a wet fall.

Mr. Hutchinson, a member of the Committee, incidentally wanted to know how to control the wheat moth, saying the insect is becoming a great pest in New Jersey and a large part of Pennsylvania and threatens to spread all over the country. Dr. Howard said, the insect was long known to be present and never attracted much attention, and the matter is in the competent hands of Dr. Headlee, the New Jersey State Entomologist, and that the chief thing to do is to trash a little earlier so that fumigation of the trashed wheat may take place that much sooner. Mr. Hutchinson said, it is impossible for every-

body to trash earlier, which, of course, is true, since the thrashing outfits would be inadequate in number, and busy only a very short time each year.

As near as can be seen the only means of control the Bureau has to offer is fumigation after the grain is thrashed. The adult infests the ripening grain in the field, also the grain in the shock, and when stacked in the barn. As long as the grain is not thrashed the pest breeds thus unchecked. When I then come and point out a new means of control as I did on pages 17 to 20 of my Circular No. 155 and pages 6 to 10 of my Circular No. 156 in describing a new system of trapping adult insects, the Entomologist talks about dishing up a theory in one breath and about having tested out the theory repeatedly and found it wanting in the next breath.

To make the point in question plain I will show how it works out in the control of the codling moth and the Oriental peach moth, a matter discussed on pages 15 to 20 of my Circular No. 155. I showed there that for the last named new pest, apparently capable of doing very much greater harm than the codling moth because of its wider food range, the Bureau has not only no practical means of control at all now, but has nothing whatever in sight. As for the codling moth you read in the report of the Entomologist for 1919 on page 5: "In the Grand Valley of Colorado codling moth losses have always been severe and many orchards have been unable to obtain satisfactory control even by thorough spraying." (By 'thorough spraying,' according to the Entomologist's report for 1918, is meant a schedule of six applications of arsenate of

lead at the rate of 4 pounds of the powdered product to 200 gallons of water with the addition of 4 pounds of fish-oil soap). "Study indicates that this was due to lack of co-operation among orchardists thoroughly to spray over a large area. Consequently arrangements were made with a number of contiguous orchardists whereby they individually agreed to spray according to the Department's recommendations and thus try out on a large scale the effect of uniformity of spraying operations over hundreds of acres. This prevents the overflow of codling moths from poorly cared for orchards into well treated orchards and good results are expected."

The Entomologist thus admits that the codling moth does a good deal of flying. After a while he may specifically want to have every pome fruit tree growing wild in the woods cut down, although in a general way he has advocated that for years, as in fact of every wild form of every plant, grasses to trees, since, of course, all serve to sustain insect pests that attack cultivated varieties. At that rate all "waste places" would have to be kept bare, while nature takes pains to cover all bare places with a mixture of vegetation.

It is well known, in fact admitted and proved by the Bureau, that the codling moth shows a strong preference for certain specially attractive varieties of pome fruits. Thus the second brood of the codling moth will heavily oviposit on sweet summer- and early fall-apples and but sparingly on less attractive varieties near by.

On page 18 of my Circular No. 155 I had recorded a case where a number of sweet-bough apples lying under a tree in

August had in the twi-light attracted thousands of codling moths. The Entomologist, being chuckful of the humbug bacillus, does not hesitate to pretend to be unable to see any possibility of taking advantage of this concentration of the moths. In the first place on pages 8 to 11 of my Circular No. 139, issued in 1913, I asked the Entomologist to satisfy himself that the codling moth is attracted to light such as the torch furnishes. He had now 7 years time to do this, but has done nothing, yet claims this feature with all others has been investigated from time to time and found wanting. If so why does he not give, even in a single case, the results, good, bad or indifferent?

"In the Ozark region of Arkansas....there are 3 full broods....and a partial fourth." Where thus the generations are overlapping, if spraying with arsenicals is to be relied on it is plain that success along the lines laid down by the Bureau, means a coating of poison all through the season. At that, admittedly, "Many orchards have been unable to obtain satisfactory control." It follows, that if poisoning is to be relied on as a means of control, the total work can be lessened if specially attractive trees are kept especially heavily poisoned.

I had pointed out on page 19 of my Circular No. 155, that, with a torch made to operate as previously described in this present circular, the smell given off by the blast blowing down upon some such a mixture as water, crushed, sweet, fermenting apples and sugar would, with the torch located near one or more trees acting as attractants because of the early fruit they produce and with the windfalls kept eaten up by hogs or

otherwise removed, result in trapping vast numbers of codling moths and this would then keep clear a large territory, including codling moths from host plants growing wild, doing away with all the expensive spraying otherwise necessary to secure a certain degree of protection. To use a torch properly means to use it during the early part of dark, warm nights whenever tests show the adults to be present in paying numbers.

Another method of controlling the codling moth and applicable to many other insects and which has never before been published is this: A number of sweet summer apple trees are planted to attract moths of the second brood through their ripening or fallen fruit. This fallen fruit, or anyway, the best of it, is gathered up and thrown into a chicken-proof enclosure. The rest is eaten by hogs or otherwise destroyed. The moths will frequent these apples and a number of chickens caged in the enclosure can secure the moths in the evening before it gets too dark. Or, these apples might be kept covered with some sort of matting during the day, and uncovered and chickens put in only in the evening and nights. A little grain scattered among the apples at twi-light will get poultry to work when most wanted.

This course it was shown on pages 9 to 13 of my Circular No. 153 is also the best means of controlling the apple maggot, present over a large part of the range of the codling moth. The apple maggot is not at all affected by poison sprays. As for the Oriental peach moth as this insect feeds upon most varieties of fruit trees, wild and cultivated, the methods outlined are of the more value in this case as this insect is affected by

poison practicalyl only when attacking fruit and then only with great difficulty and expense. The two first broods, out of a possible 4 broods in Maryland, where the insect first attracted attention, breed in growing twigs, stunting them and cannot be effectively poisoned and are but little affected by other expensive official means recommended that seem to act chiefly as repellents and are discussed on pages 15 to 17 of my Circular No. 155. To catch the early broods with a torch trap in the absence of sweet apples, applejuice, or apple jelly and sugar, allowed to ferment, will be about the thing to use in the pail in these prohibition days, sweetened hard cider probably being the best. This then will equally affect the codling moth and other insects of similar habits, as for instance the bud moth, also very difficult to fight by spraying, the only official means advocated.

Still another way to kill the codling moth, the Oriental moth and various pests of similar habits would consist in exposing in a cage accessible to them mashed sweet apples or sweetened apple juice allowed to ferment that have been treated with some suitable poison. In this case, of course the possible effect on beneficial insects has to be watched also. To come back to the control of the wheat moth in the adult form, the family of insects to which this moth belongs feeds but little or not at all as adults and is also but little attracted to lights. Assuming that the wheat moth doesn't sip water and nectar to be found on plants, it may yet succumb in paying numbers to a trap torch giving forth an inviting smell by fermenting sweet fluid, which means the presence of alcohol.

After the sheaves have been stacked in the barn, it would be feasible to thus operate a torch there. It could be lighted outside and then hung or hoisted up to a safe place in the barn. Barns cannot be fumigated. Nor can moths be kept away. Hence the most promising method for control in barns previous to thrashing would seem to be using a trap torch for a couple of hours once a week or so. All that is necessary is to put enough gasoline in to run the length of time desired and hang the apparatus up in a place made safe, when it will run its time without attention.

In mills this course will keep infestation down, doing away with fumigation entirely or partly. If the moth sips liquids, in mills another, easier way is feasible. A solitary electric light of low candle power left burning of nights with some poisoned sweet scented fluid nearby could be made to exert a daily reduction of the various adult flying insects that pass through the mill.

Mr. Ruby, of Missouri, wanted to be shown what insect it was that affected the quality and quantity of the gooseberry pies in his district the past summer. It was found that the imported currant worm was responsible. Dr. Howard said in substance, the first brood is to be destroyed by the use of an arsenical, while, if the pest is present when the fruit is ripening, it is killed by the use of hellebore. Now this, in itself, is well enough. If we had to deal only with insects on the more valuable plants and such as are amenable to treatment by poison, there would not be much need for improved means of

insect control.

Taking the currant worm for an example one or more sprayings or dustings with an arsenical while the first brood worms are small, and this carried out over a neighborhood and not confined to a single garden, will practically put an end to the worms for that year in that locality, and there will be no need to use **the much more expensive hellebore.** In practice we find, however, that usually the worms are left to grow and multiply unnoticed till serious damage results when they are much more difficult to kill with poison and devour the balance of the leaves, if disposed off by making them take the poison cure, with a possible numerous second brood calling for the use of hellebore, with a few leaves to apply it to, making the treatment expensive and unsatisfactory. If the worms of the first brood have thus been allowed to become large before noticed, it is much better to apply a hot air blast with a torch constructed along the lines of the apparatus shown on last page. Such a blast kept swaying over the bushes makes the worms drop, to be killed on the ground. Such a blast incidentally licks off what spores of fungi are present, also affects any San Jose scales or other sucking insects that are present and not amenable to the use of poison, and early in the season is the best and cheapest means by far to keep down the currant aphis and when used then will get most of the first brood currant worms then hatching.

Take another case: An apple orchard is affected by canker worms or other worms devouring the leaves as fast as they appear, or by the adults of the pear thrips, not amenable to

poison, but calling for a special nicotine-sulphate spray applied at high pressure under the Bureau's plan, causing many to become knocked off before they are seriously injured. The cankerworms are usually too numerous or too far developed to be much affected by poison, since there is usually but little foliage left to carry any poison. As far back as my Circular No. 147, 1915 I showed that there is no mechanical difficulty to rig up a torch along the lines of the tower spraying outfits or to rearrange this same outfit to act on insects or fungi at or near the ground, such as on grain and forage crops. Two men on the tower each handle a torch and make the worms drop, while two on the ground lick the fallen worms over at close range to die afterwards. In doing this they also lick over the fallen leaves on the ground, destroying the spores that would otherwise cause scab on the leaves and fruit. The licking of the tree more or less completely destroys lice, bark and scales if present. There is no need to apply enough heat at any one time to cause any injury, since such licking is to be done from time to time to lick off other insects as for instance the larvae of the highly injurious pear thrips and the spores of fungi on fruit, foliage and bark.

The fungus diseases are worst during the warm, moist weather. Sprays not only are liable to get washed off, but the fungus diseases spread in muggy weather enormously fast and spraying is too slow for best results, while licking with a torch the fruit, foliage and bark, especially licking into the cracks caused by cankers, and licking over the ground below, especially the fallen fruit, is vastly quicker, surer and cheaper

than the present method.

On page 6 of his report for 1919 the Entomologist says the official means to control the grape mealy bug, doing damage of late years in California, consists in fumigating with cyanide of soda and with sulphur fumes during the dormant season at night. Obviously this method is slow and expensive. On page 37 of my Circular No. 155 I had pointed out that the use of a torch during the growing season not only keeps this pest easily down, but at the same time keeps down the grapeleaf hopper and fungus diseases. "With the exception of the phylloxera, the vine hopper is undoubtedly the most destructive insect pest in California," (Cal. Exp. Sta. Bull. No. 198, p. 178). These hoppers easily succumb to repeated slight swift lickings with a blast, especially while in the nymphal stage. Early in the season during cool periods, the adults hide largely under shreds of bark, places preferred by the mealy bug. Woody canes stand a pretty sharp licking, making easily possible the destruction of the mealy bug by the use of a torch.

Two closely related mealy bugs infest the citrus fruits of California. They are discussed in Farmess' Bulletin No. 862. Most of the sections of California where mealy bugs are a factor are overrun by the Argentine ant. These and other ants harbor and distribute mealy bugs and defend them against their natural enemies, causing thus, it is officially estimated, an increase five times over what their number otherwise would be.

On orange trees it is possible, so the Entomologist states

on page 14 of his 1919 report, to profitably keep the ants off the trees by banding and by the use of ant poison. This banding is apparently essentially the method described on page 13 of Farmers' Bulletin No. 862 and consists in applying a 5 inch band of paraffin to the tree trunk and over this a mixture of sulphur and sticky tree-banding material "almost one-fourth inch thick." Whether such bands used year after year do not interfere with the health of the tree remains to be seen. Thus far: "....direct application of the commercial sticky tree-banding material alone has never been noted in California to affect citrus trees seriously" (p. 13).

Such use of banding and poison is merely a preventive against the attack by ants on the tree. It does not prevent the ants from breeding under possible trash on the ground, and especially not on rank vegetation around the citrus groves. Orange trees are affected by numerous sucking insects and also some biting ones. The sucking ones—scales, rustmites, red spiders, thrips, mealy bugs—are all amenable to the use of a torch blast. It can readily be used at night. Unless the torch is used, you have, according to official advice, to spray or fumigate for the mealy bug, the same as for scales during the cool part of the year, or, during summer, when sprays are admittedly not safe (F. B. No. 862, p. 10), you have to use a high pressure water spray. For mites and red spiders you are told to use finely powdered sulphur, for thrips to spray with tobacco extract dilution or other suitable sprays. These sprays and powders do not appreciably affect the Argentine ant nor do they affect catydids, also often present in large numbers. A

blast from a suitable torch affects all these insects and without injuring the trees, if used with as much judgment as is required in using other means of control.

For the control of catydids the Bureau recommends 2 sprayings with arsenicals, estimating cost per acre at $5.00 (D. A. Bull. No. 256, p. 24). This is admitted to be of value only while the catydids are in the first three nymphal stages. There is no reason why two lickings with a torch would not answer as well. In that case these lickings affect all the sucking insects and the ants present, while the arsenical spray does not affect them.

But oranges, in Southern California at least, are subject also to attack by the orange tortrix, an insect having habits similar to the codling moth. It is discussed in California Experiment Station Bulletin No. 214, p. 494, issued in 1911. This insect, like the catydids, originally fed upon plants other than the orange, hence as orange culture increases, may be looked for to increase in virulence. "During the season of 1909-10 it was the cause of considerable concern in certain sections of the southern California citrus belt." Its food habits render it even less susceptible to the use of an arsenical spray as a means of control than is the codling moth. There are three broods a year. Poultry would probably be of value in destroying fallen infested fruit. With the ground otherwise kept bare there is but little for poultry to feed on except Argentine ants, and, as a rule, some grasshoppers. It would be feasible to maintain a flock of poultry in the grove, changing the location daily, protecting them if necessary against ants at night

by furnishing roosts made ant proof. The only other additional means promising control of the orange tortrix is the use of a sweetish smell produced by the use of a torch as a trap at night, as described for the codling moth.

It is all very well for the Department of Agriculture to go after the man that puts cedar sawdust in the pepper he sells, but what about the U. S. Entomologist that put deliberately hum in his bugology?

The discovery of two new serious wheat diseases during 1919 in Madison County, Illinois, discussed in Farmers' Bulletin No. 1063, brings up with renewed force the question of controlling fungus diseases on grain and forage crops. The new fungi in question are the "Take All," according to the Bureau of Plant Industry a sac fungus, and present also in Indiana, and the "flagsmut," "one of the true smuts" (p. 2).

Disinfection of the seed is usually, if not always, of no use in the control of a sac fungus. And in any case such disinfection would be only a partial remedy, since spores capable of causing infection are present on the land. To illustrate: Corn smut is caused by a sac fungus. The spores that start the disease on corn live over winter on diseased dead cornstalks, infected manure, other combustible matter and in the soil. They there sprout and produce a crop of spring spores which are blown by the wind onto corn plants to start the disease again. No official means of control at all satisfactory is known.

The use of a torchblast offers, as far as can be seen, the

only workable means of attacking the fungus during the growing season. In explanation, bearing in mind that the flame from a torch is capable of licking off fungus spores, it will be well to first look at the known possibilities in the use of a torch towards the control of the chinchbug on corn. As far back as 1898 I described a satisfactory method of using a torch on corn for chinchbugs, laying stress on the fact that the bugs largely hide under clods at the base of the plant during the night, mornings and cool days, and that licking these clods then does away with all injury to the corn. Besides if a few outer rows were thus necessarily injured or destroyed in combating migration of bugs from nearby small grain, these few rows could be seeded to stockpeas or some other suitable crop and this method of control would still remain far the cheapest.

Soon after 1898 I heard of a case, when a farmhand, I believe in Sangamon County, Illinois, rigged up a 2-horse corn cultivator with 2 torches or more to blow heat onto the plants as a means of destroying chinchbugs while the cultivator went around. It would have been possible to use 8 torches, one in front and one in the rear of each hoe. Now if some such arrangement of torches to sweep all of the ground in front of the shovels were provided, it would be possible to lick the spores of cornsmut off before the shovels disturb the soil. This, especially if repeated at each cultivation, would practically break the circuit of the fungus and control the disease and do this at very little cost.

The infection of wheat in the case of the take-all fungus may and may not be along these same lines. The fact is, the

nature of the take-all disease is as yet obscure. Two diseases similar to the take-all fungus are thus described in Circular No. 228 of the Illinois Agricultural Experiment Station: "The spores of the loose smuts of wheat and barley ripen at the time the healthy plants are in bloom. These spores are blown about by the wind and many of them find their way into the flowers of the healthy plants. Here these spores give rise to smut infection within the very young kernels, which mature without any outward evidence of the presence of the disease. When such kernels are sown, the plants which come from them will produce smutted heads. Because the infection is internal, a method of seed treatment must be used which will have a deeper influence than formaldehyde. Experiment have shown that the smut fungus is more easily killed by heat than are the germs of the grain, and this fact has led to the use of the hot-water method of treatment.... If the temperature rises above 131 F., the vitality of the grain will be seriously injured, if it falls below 124 degrees Fahrenheit it will be ineffective. . . . This treatment is often injurious to the vitality of the grain.... Because of the tediousness of this process, it is commonly used to obtain smut-free seed for a small plat from which sound healthy seed may be taken for general seeding the following year."

Of course this seed plat is subject to infection from other fields, since the spores can be carried for miles. Again other fungus diseases may also be present. Suppose stinking smut is also present. The seed can be cleared of spores clinging to it by the formaldehyde treatment officially recommended. On

pages 28 to 35 of my Circular No. 155 this matter of fungus control by the use of a blast is discussed and on page 35 is given a way of clearing seed by the use of a torchblast: ".... by letting the seed slide slowly down over a wire screen and letting one torch, or, better, two or more torches from different directions, play upon the seed, thus licking it clean...." But cleaning the seed does not prevent other spores present in old straw, manure, in the soil or blown in by the wind from other fields from affecting the plants. Suppose a suitable automobile truck with rather high wheels were fitted with a row of burners to sweep the ground while the spring crop of spores is getting ready to be blown up to the plant, this course then would work on all of the fungi. This could be repeated as necessary at intervals as long as the grain plants rolled down by the wheels have sufficient flexibility to rise up enough to permit of the gathering of the heads. This then will lick off the spores from the plants and on the ground and will result in a correspondingly reduced infection for the year following. As now proposed: ". . . On farms which are infected (by the take-all fungus) a system of crop rotation should be used which keeps wheat, oats, barley and rye off the land for four or five years ...." This is too long for practical results, besides spores would be blown in from adjoining fields, and, further, the black stem rust fungus attacking wheat can survive on many wild grasses. Hence a direct means of attack during the growing season, such as is found in a blast blowing onto the growing plants and to the soil offers the best chance of success.

There is a great variance of opinion as to what the life

circuit of the take-all fungus really is. Thus in a Bulletin, issued in October 1919 by the Division of the Natural History Survey of the Department of Registration and Education of the State of Illinois, Stephen A. Forbes, Chief, and written by Prof. F. L. Stevens, the opinion is given on page 263 that "we have here several distinct diseases due to as many separate causes."

However one thing can be considered as manifest: that the disease that does the actual damage must be caused by a parasitic fungus. On the other hand it seems that the same fungus can subsist and produce spores forming the successive stages of the circuit on the dying and dead plant, being thus in its later stages saprophytic.

With these spores produced on the dying or dead plant at the time the wheat plant is in bloom, the disease could be spread by them, infecting the incipient seed—and this probably is what happens in this particular case—or it is also possible the spores may cling to decaying vegetation, the soil, and to the as yet growing and ripening plants, and later to the seed, to infect the young plant as it develops from the healthy seed. In any case spores must be produced for reproduction and this chiefly happens during the period while wheat is in bloom. Therefore, then, in any case, licking the plants over with a torch at suitable intervals is the most feasible means now known to destroy the spores.

While the Bureau of Plant Industry has been wanted for 22 years to satisfy itself whether or not a blast from a torch does destroy the spores of fungi, and has done nothing, it so

happens that Dr. S. A. Forbes had investigated to a certain extent the claims made by me as far back as 1898 on this point, and had published the results of a test along this line as far back as 1903, a matter referred to on pages 31 and 32 of my Circular No. 155.

As to insects Dr. Forbes did not give the matter a decent test, since this use of a blast was intended chiefly for sucking insects such as lice, scales, grapeleaf hoppers, or insects hidden about or under the plants as chinchbugs, harlequin bugs and vine crop pests and for such leaf eating insects that are not readily killed by poison and especially if they are gregarious, as are fleabeetles and blisterbeetles, or for caterpillars that had eaten up nearly all of the foliage. Dr. Forbes practically ignored all these and claimed he could not readily kill a woolly-bear caterpillar with a blast. Neither coud he have killed it at all readily with poison. These caterpillars are general feeders, pupate under rubbish and had best be combated with poultry scratching for their cocoons, usually located in ground covered by a heavy stand of grass.

Nor does this point matter just now. This was a matter for Chief Howard and his staff to test out thoroughly. As far as they were concerned, they took a cabbage thickly infested with lice and attempted to rid it by one application of the blast, using too much of course, then reporting the method to be useless. No spray could rid such a plant even with several applications freely made, while the proper use of the torch consists in frequent slight lickings, never giving the lice a chance to become plentiful. This is immensely better and

cheaper than the use of a spray, recommended by the Bureau to be used at the start and at inervals.

Thus in the case of the melon aphis for instance the blast is blown slantways upon the ground when the deflection reaches the underside of the leaves, whereas the Bureau, as explained in detail on pages 2 to 7 of my Circular No. 153, shows on page 1 of Farmers' Bulletin No. 914 one man lifting a vine and another using a compressed air sprayer to do the spraying, very slow and expensive. Besides vine crops do not want to be handled.

However Dr. Forbes tested the blast also on at least one kind of fungus. He found he could lick off the spores from a mildewed lilac leaf and, while admitting this was satisfactorily accomplished, said that after some days another crop of spores was found to have appeared. Of course this second crop was produced by the mycelium working inside of the leaf, same as the first, and the fact that it was produced at all shows that the leaf had not been injured when the first coat of spores was licked off. Thus the whole question resolves itself to whether it will be possible to apply a blast under the varied conditions to be encountered at low enough sost. There is no difficulty in constructing a torch for any purpose, similarly as the various spraying machines of today were evolved from the bucket spray pump. As for cheapness, a blast generated by gasoline is far the cheapest combined contact insecictide and fungicide and the only means that can at present be considered to destroy fungus spores on grain and forage crops. Of course there is need for a method of utilizing a lower grade

of fuel for this same purpose.

At the present rate of use the supply of mineral oils will be exhausted in a romparatively short time. Consequently any suggestion of an increased use should be met by an attempt to devise some means to make use of a killing agent for insects and fungi that is likely to be available for many or all generations to come.

It should prove feasible to use electricity. While water power may increase sharply in cost, we are not likely to run short of winpower. This should give us reasonably cheap electricity till doomsday.

Inasmuch as insects and fungi have to be combated chiefly during the warm part of the year, the ideal way would seem to be to make use of the rays of the sun, by concentrating them by the use of a suitable mirror right on the job, and thus finding a way to create a flame and heat and apply same to the vegetation as you go.

"Not all is graft and politics down in Washington," says Secretary of Agriculture Meredith in referring to a reduction in appropriations for his Department. Evidently he does not look for much else outside of the Executive Departments. "I am going to work as advertising manager of the Department and if I can give the people some idea of the honest work done and the benefits derived from them I will do it." On the the other hand he deplores "the tendency to discuss waste, graft and soft snaps," as regards the Executive Departments.

"Washington," in this case, evidently means Congress.

But it can be shown that on the whole, there is neither more nor less graft in Congress than the Majority, that sends the Members, wants them to have, and that, if Secretary Meredith really wants to do the country one sure enough good turn and set a good example, at existing appropriations, he simply has to bring the issues discussed in this Circular up for honest work by the respective Members of his official Family.

For example: The majority of the Voters instructed the Members of Congress to pass the prohibition law we now have, and Congress did its best in having it passed. On the other hand some little movement was attempted in the past to prohibit divorce, and Congress did not pass a law prohibiting it, simply because there was not even a slight prospect that a majority of the Voters wants it prohibited. That shows that Congress does give the People what the majority of the Voters want, and if the thing thus given proves to be no good, Congress puts the blame on the people where it justly belongs. As long as most Congressmen are expected to get the largest possible appropriations for their respective territories, so long we shall hear about misappropriations.

We have now had prohibition long enough to see how it is working out. The rich antis go in swarms across the border to Mexico, Cuba and Canada to tank up and gamble, spending about 2 billion dollars a year. The middle class and the poor manage things at home. You cannot keep tap on them singly, not by spending a billion dollars a year in enforcing the law. Personally I am a total abstainer since many years but I believe that humanity is best served by permitting a strictly

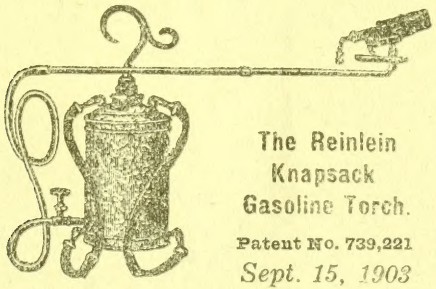
temperate use of alcoholic beverages. Of course, they, as all else good in itself, can be misused. As long as we cannot get a majority of people to voluntarily live temperate lives and to enforce a law to that effect, it will be useless to try to make things better by an attempt to enforce an absurdedly strict prohibition law. It is not much of a raisin pie that does not exceed the limit of one-half per cent of alcohol. It is better to fry the fat right at home out of those that make hogs of themselves through drink, than to have them carry the money across he border.

We often hear it said that this country of ours is a Christian one. If so, Christ sanctioned the temperate use of alcoholic beverages by His example. On the other hand, look at divorce. Christ absolutely forbids it. Where then does the Christianity of the majority come in?

It is unlawful to say the Lord's prayer in our public institutions of learning. Consequently they are un-Christian and anti-Christian. It is not lawful to instruct the child towards a belief in God in these schcools. Consequently they are in the last analysis atheistic. That this is so is proven by the fact that atheists are loud in the condemnation of those that maintain private schools where religion is taught. The child is taught in the public schools to imitate Washington, Franklin and other great Americans, but sight is lost of the fact that these men were not the product of atheistic schools. They took Christ for their pattern and made a more or less successful effort to imitate Him. The child in our public schools hears nothing of the humility, purity, obedience and voluntary pov-

erty as shown in Christ's life and in that of His followers. It is no wonder then that crime increases in leaps and bounds, especially among the young, and statistics show that children of divorced people make far the worst showing. If we do not like this, we have to see that some better seed is planted. The trouble is with ourselves. Absence of belief in God results in an inordinate love of created things by both rich and poor, and the worship of the golden calf.

Since we all are liable to fall, it is only fair, relative to the issues under discussion, that Secretary Meredith make good his claim of giving honest service by having his experts do what they were all along wanted to do—to either admit that I am right, or show wherein I am wrong.



The Reinlein
Knapsack
Gasoline Torch.

Patent No. 739,221
Sept. 15, 1903

LIBRARY OF CONGRESS
0 015 793 696 7